American Red Cross

OM – G:
What is it?

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Learning Objectives

After participating in this course, you will be able to:

- Identify when G studies are indicated
- Understand how to perform G investigation
- Determine if a patient is a candidate for RhIg

The G antigen

- G is an antigen in the Rh blood group system
  - Specifically, G maps to the shared exon 2 and the 103-serine residue on RhD, RhCe, and RhCE proteins
- G is present on all D positive and C positive cells

The G antibody

- Serologically presents as anti-D plus anti-C
- When only anti-G is present:
  - Anti-G often reacts more strongly cells that are D+C+
- Routine Transfusion:
  - Not necessary to distinguish between the antibodies
  - Products negative for C and D will usually be negative for G
- Prenatal serologic investigation:
  - A patient may demonstrate anti-G without the presence of anti-D
  - That patient is a candidate for RhIg

G Investigation

Two Adsorptions; One Eluate

- R2R2
- r‘r
- G is in the eluate

Sequential Adsorptions

- Two eluates
- More complicated
- Uses patient sample

Routine IRL Prenatal Investigation

- ABO using anti-A, anti-B, anti-A,B, and A1, A2, and B cells
- Rh type using anti-D including weak D testing
- Rh phenotype testing the patient for C, E, c, and e
- DAT is performed using polyspecific antihuman globulin
  - A positive DAT with polyspecific AHG will reflex to DATs with anti-IgG and anti-C3
- An 11-cell panel and auto control in tube at IS and PEG/IAT
- This testing is performed on all first time submissions
  - Subsequent samples sent for antibody titration do not include blood typing or DAT unless indicated

Case Study #1

- Age: 33
- Gender: Female
- Race: White
- ABO/Rh: A Negative
- Known Antibodies: anti-D and anti-C
- Diagnosis: Pregnancy
- Pregnancy History: currently 8 weeks into her 2nd pregnancy
- Medications: None, RhIg not given
- Transfusion History: Never

Case Study #1

Initial Antibody Testing

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	M	N	S	s	Le^a	Le^b	P_1	IS	Peg IgG
1	+	0	+	+	0	0	+	0	+	+	+	0	+	0	+	0	+	+	0	2+
2	+	0	+	+	0	0	+	+	+	+	0	+	0	+	+	0	+	+	0	2+
3	0	+	0	+	+	0	+	+	+	+	0	+	+	0	+	0	+	+	0	3+
4	0	+	0	+	+	0	+	+	+	0	+	+	0	+	0	0	+	+	0	3+
5	0	0	0	+	+	0	+	+	0	+	+	+	0	+	0	+	0	+	0	0√
6	0	0	+	+	+	0	+	+	+	+	0	0	+	0	+	0	+	0	0	0√
7	0	0	0	+	+	+	0	0	+	0	+	+	+	+	+	0	+	+	0	0√
Patient																			0	0√

Case Study #1
Initial Antibody Testing

	D	C	~~E~~	~~c~~	~~e~~	~~K~~	~~k~~	~~Fy^a~~	~~Fy^b~~	~~Jk^a~~	~~Jk^b~~	~~M~~	~~N~~	~~S~~	~~s~~	~~Le^a~~	~~Le^b~~	~~P_1~~	IS	Peg IgG
1	+	0	+	+	0	0	+	0	+	+	+	0	+	0	+	0	+	+	0	2+
2	+	0	+	+	0	0	+	+	+	+	0	+	0	+	+	0	+	+	0	2+
3	0	+	0	+	+	0	+	+	+	+	0	+	+	0	+	0	+	+	0	3+
4	0	+	0	+	+	0	+	+	+	0	+	+	0	+	0	0	+	+	0	3+
5	0	0	0	+	+	0	+	+	0	+	+	+	0	+	0	+	0	+	0	0^v
6	0	0	+	+	+	0	+	+	+	+	0	0	+	0	+	0	+	0	0	0^v
7	0	0	0	+	+	+	0	0	+	0	+	+	+	+	+	0	+	+	0	0^v
Patient																			0	0^v

Cells 5, 6, and 7 are nonreactive

- This rules out everything except D and C

Cells 1 and 2 are reactive

- They are D positive and C negative, proving anti-D

Cells 3 and 4 are reactive

- They are D negative and C positive, proving anti-C

Case Study #1

Knowledge Check

Are we confident the serum contains only anti-D and anti-C?

- No

What else could this reactivity indicate?

- Anti-G

How does anti-G present?

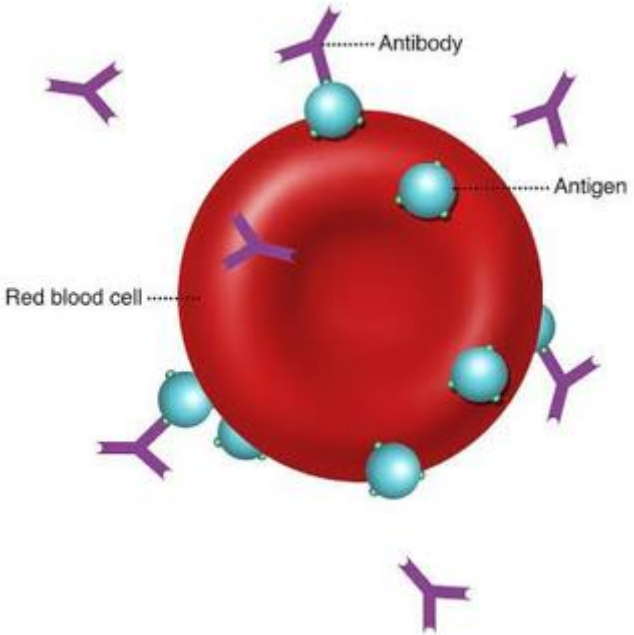
- Anti-G reacts with most cells positive for D and/or C antigen

Adsorptions

R_2R_2 Cells

- D, E, c, G positive

If anti-D and/or anti-G is present, it will be adsorbed onto the cells and removed from the patient sample



Case Study #1

R_2R_2 adsorbed plasma

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	M	N	S	s	Le^a	Le^b	P_1	PEG IgG
1	+	0	+	+	0	0	+	0	+	+	+	0	+	0	+	0	+	+	0√
2	+	0	+	+	0	0	+	+	+	+	0	+	0	+	+	0	+	+	0√
3	0	+	0	+	+	0	+	+	+	+	0	+	+	0	+	0	+	+	w+
4	0	+	0	+	+	0	+	+	+	0	+	+	0	+	0	0	+	+	w+
5	0	0	0	+	+	0	+	+	0	+	+	+	0	+	0	+	0	+	0√
6	0	0	+	+	+	0	+	+	+	+	0	0	+	0	+	0	+	0	0√
7	0	0	0	+	+	+	0	0	+	0	+	+	+	+	+	0	+	+	0√
Patient																			

Case Study #1

R_2R_2 adsorbed plasma

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	M	N	S	s	Le^a	Le^b	P_1	PEG IgG
1	+	0	+	+	0	0	+	0	+	+	+	0	+	0	+	0	+	+	0^v
2	+	0	+	+	0	0	+	+	+	+	0	+	0	+	+	0	+	+	0^v
3	0	+	0	+	+	0	+	+	+	+	0	+	+	0	+	0	+	+	w+
4	0	+	0	+	+	0	+	+	+	0	+	+	0	+	0	0	+	+	w+
5	0	0	0	+	+	0	+	+	0	+	+	+	0	+	0	+	0	+	0^v
6	0	0	+	+	+	0	+	+	+	+	0	0	+	0	+	0	+	0	0^v
7	0	0	0	+	+	+	0	0	+	0	+	+	+	+	+	0	+	+	0^v
Patient																			

Cells 1 & 2 are nonreactive

- D+, C-
- Verifies anti-D and/or anti-G has been absorbed out

Cells 3 and 4 are reactive

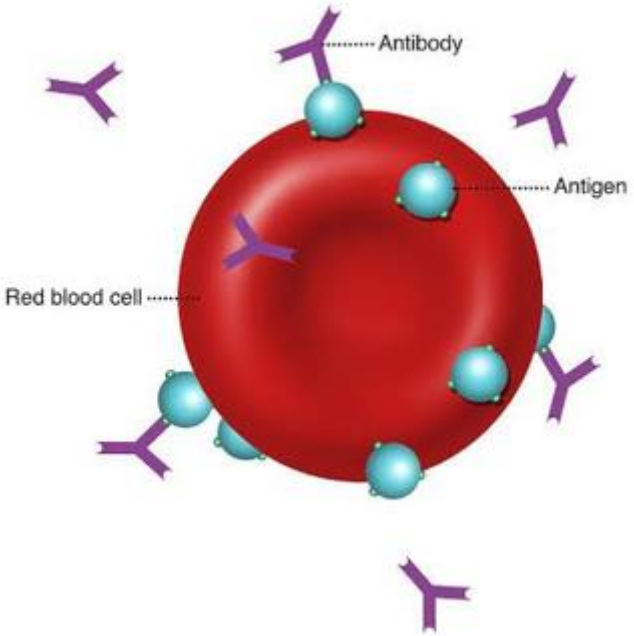
- They are D negative and C positive
- This proves anti-C

Adsorptions

r′r Cells

- C, c, e, G positive

If anti-C and/or anti-G is present, it will be adsorbed onto the cells and removed from the patient sample



Case Study #1

r’r adsorbed plasma

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	M	N	S	s	Le^a	Le^b	P_1	PEG IgG
1	+	0	+	+	0	0	+	0	+	+	+	0	+	0	+	0	+	+	w+
2	+	0	+	+	0	0	+	+	+	+	0	+	0	+	+	0	+	+	w+
3	0	+	0	+	+	0	+	+	+	+	0	+	+	0	+	0	+	+	$0^{\surd}$
4	0	+	0	+	+	0	+	+	+	0	+	+	0	+	0	0	+	+	$0^{\surd}$
5	0	0	0	+	+	0	+	+	0	+	+	+	0	+	0	+	0	+	$0^{\surd}$
6	0	0	+	+	+	0	+	+	+	+	0	0	+	0	+	0	+	0	$0^{\surd}$
7	0	0	0	+	+	+	0	0	+	0	+	+	+	+	+	0	+	+	$0^{\surd}$
Patient																			

Case Study #1

r’r adsorbed plasma

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	M	N	S	s	Le^a	Le^b	P_1	PEG IgG
1	+	0	+	+	0	0	+	0	+	+	+	0	+	0	+	0	+	+	w+
2	+	0	+	+	0	0	+	+	+	+	0	+	0	+	+	0	+	+	w+
3	0	+	0	+	+	0	+	+	+	+	0	+	+	0	+	0	+	+	0^v
4	0	+	0	+	+	0	+	+	+	0	+	+	0	+	0	0	+	+	0^v
5	0	0	0	+	+	0	+	+	0	+	+	+	0	+	0	+	0	+	0^v
6	0	0	+	+	+	0	+	+	+	+	0	0	+	0	+	0	+	0	0^v
7	0	0	0	+	+	+	0	0	+	0	+	+	+	+	+	0	+	+	0^v
Patient																			

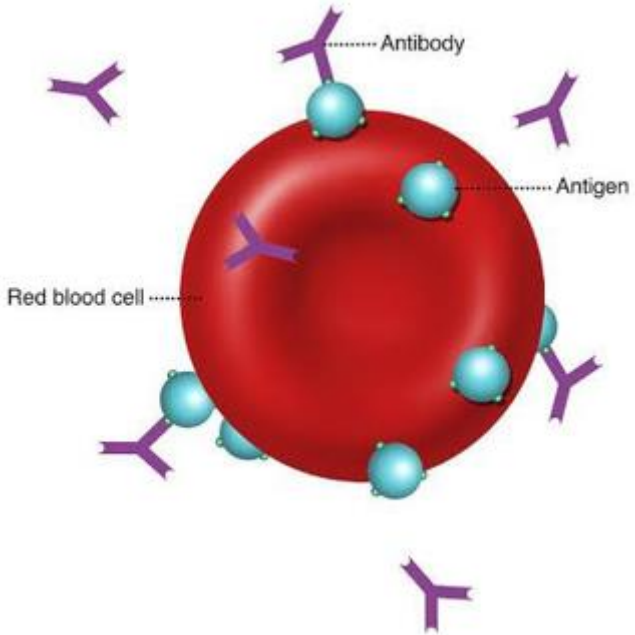
Cells 3 & 4 are nonreactive

- D-, C+
- Verifies anti-C and/or anti-G has been absorbed out

Cells 1 and 2 are reactive

- They are D positive and C negative
- This proves anti-D

Adsorptions/Elutions



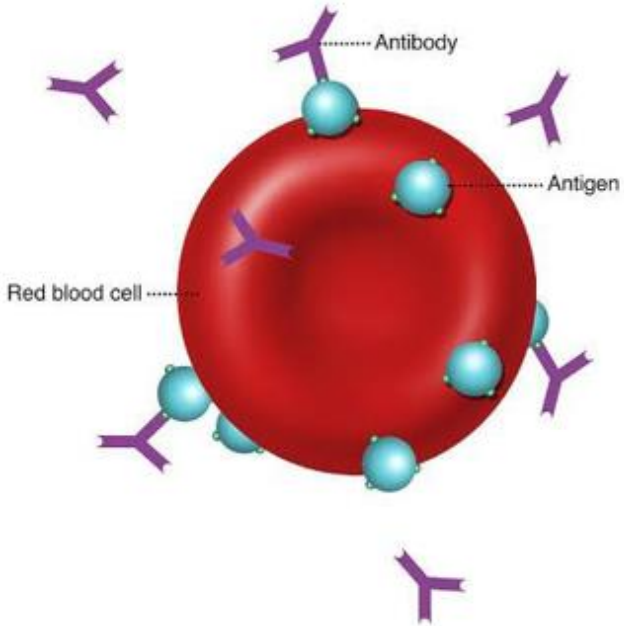
R_2R_2 Cells

- D, E, c positive

If anti-D and/or anti-G is present, it will be adsorbed onto the cells

We can test for the presence of anti-D and anti-G by performing an elution on the adsorbing cells

Adsorptions/Elutions



r’r Cells

- C, c, e positive

If anti-C and/or anti-G is present, it will be adsorbed onto the cells

We can test for the presence of anti-C and anti-G by performing an elution on the adsorbing cells

Case Study #1

Eluate from the R_2R_2 adsorption

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	M	N	S	s	Le^a	Le^b	P_1	PEG IgG
1	+	0	+	+	0	0	+	0	+	+	+	0	+	0	+	0	+	+	1+
2	+	0	+	+	0	0	+	+	+	+	0	+	0	+	+	0	+	+	1+
3	0	+	0	+	+	0	+	+	+	+	0	+	+	0	+	0	+	+	1+
4	0	+	0	+	+	0	+	+	+	0	+	+	0	+	0	0	+	+	w+
5	0	0	0	+	+	0	+	+	0	+	+	+	0	+	0	+	0	+	0√
6	0	0	+	+	+	0	+	+	+	+	0	0	+	0	+	0	+	0	0√
7	0	0	0	+	+	+	0	0	+	0	+	+	+	+	+	0	+	+	0√
Patient																			

Case Study #1
Eluate from the R2R2 adsorption

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	M	N	S	s	Le^a	Le^b	P_1	PEG IgG
1	+	0	+	+	0	0	+	0	+	+	+	0	+	0	+	0	+	+	1+
2	+	0	+	+	0	0	+	+	+	+	0	+	0	+	+	0	+	+	1+
3	0	+	0	+	+	0	+	+	+	+	0	+	+	0	+	0	+	+	1+
4	0	+	0	+	+	0	+	+	+	0	+	+	0	+	0	0	+	+	w+
5	0	0	0	+	+	0	+	+	0	+	+	+	0	+	0	+	0	+	0^v
6	0	0	+	+	+	0	+	+	+	+	0	0	+	0	+	0	+	0	0^v
7	0	0	0	+	+	+	0	0	+	0	+	+	+	+	+	0	+	+	0^v
Patient																			

Cells 3 and 4 are reactive

- They are D negative and C positive
- If only Anti-D, -C were present in the plasma there should be no Anti-C reactivity in this eluate
- This proves anti-G

Case Study #1

Summary

- Initial testing indicates anti-D, anti-C, and/or anti-G is present in the patient plasma
- Anti-C is confirmed using the R_2R_2 adsorbed plasma
- Anti-D is confirmed using the r'r adsorbed plasma
- Anti-G is confirmed using the eluate from the R_2R_2 adsorption

Conclusion

Antibody identification:

- Anti-D
- Anti-C
- Anti-G

Additional alloantibodies were excluded in the neat plasma

Case Study #1

Administration of Rh Immune Globulin?

- No
- Why?
  - Patient has already developed anti-D

Case Study #2

- Age: 26
- Gender: Female
- Race: Black or African American
- ABO/Rh: A Negative
- Known Antibodies: anti-D, anti-C
- Diagnosis: Sickle Cell Anemia, Pregnancy
- Pregnancy History: current; 2nd pregnancy
- Medications: Not Provided; RhIg not given
- Transfusion History: >3 months

Case Study #2

Initial Antibody Testing

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	M	N	S	s	Le^a	Le^b	P_1	IS	Peg IgG
1	0	0	+	+	+	0	+	+	w	0	+	+	0	+	0	0	+	+	0	0√
2	0	0	0	+	+	+	0	+	+	0	+	+	0	0	+	+	0	+	0	0√
3	0	0	+	+	+	0	+	+	+	+	0	+	+	+	+	+	0	0	0	0√
4	0	0	0	+	+	+	+	0	+	0	+	0	+	0	+	0	+	+	0	0√
5	0	0	0	+	+	0	+	+	0	+	0	0	+	0	+	+	0	+	0	0√
6	+	0	+	+	0	0	+	+	+	+	+	+	+	+	+	0	+	+	0	3+
7	+	0	+	+	+	+	0	0	+	+	0	+	+	+	+	0	0	+	0	3+
8	0	+	0	+	+	+	+	+	w	+	+	+	+	+	0	0	0	0	0	3+
9	0	+	0	+	+	+	+	+	0	0	+	+	0	+	+	+	0	0	0	3+
Patient																			0	0√

Case Study #2
Initial Antibody Testing

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	M	N	S	s	Le^a	Le^b	P_1	IS	Peg IgG
1	0	0	+	+	+	0	+	+	w	0	+	+	0	+	0	0	+	+	0	0[v]
2	0	0	0	+	+	+	0	+	+	0	+	+	0	0	+	+	0	+	0	0[v]
3	0	0	+	+	+	0	+	+	+	+	0	+	+	+	+	+	0	0	0	0[v]
4	0	0	0	+	+	+	+	0	+	0	+	0	+	0	+	0	+	+	0	0[v]
5	0	0	0	+	+	0	+	+	0	+	0	0	+	0	+	+	0	+	0	0[v]
6	+	0	+	+	0	0	+	+	+	+	+	+	+	+	+	0	+	+	0	3+
7	+	0	+	+	+	+	0	0	+	+	0	+	+	+	+	0	0	+	0	3+
8	0	+	0	+	+	+	+	+	w	+	+	+	+	+	0	0	0	0	0	3+
9	0	+	0	+	+	+	+	+	0	0	+	+	0	+	+	+	0	0	0	3+
10	+	0	+	+	0	+	+	+	+	+	+	+	+	0	+	0	+	0	0	3+
Patient																			0	0[v]

- Cells 6, 7, and 10 show apparent anti-D
- Cells 8 and 9 show apparent anti-C
- All other common alloantibodies are ruled out

Case Study #2

Knowledge Check

Next Steps:

- R_2R_2 adsorption
- r‘r adsorption
- Eluation from at least one of the adsorbing cells

Case Study #2

R_2R_2 adsorbed plasma

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	M	N	S	s	Le^a	Le^b	P_1	PEG IgG
1	0	0	+	+	+	0	+	+	w	0	+	+	0	+	0	0	+	+	$0^{\surd}$
2	0	0	0	+	+	+	0	+	+	0	+	+	0	0	+	+	0	+	$0^{\surd}$
3	0	0	+	+	+	0	+	+	+	+	0	+	+	+	+	+	0	0	$0^{\surd}$
4	0	0	0	+	+	+	+	0	+	0	+	0	+	0	+	0	+	+	$0^{\surd}$
5	0	0	0	+	+	0	+	+	0	+	0	0	+	0	+	+	0	+	$0^{\surd}$
6	+	0	+	+	0	0	+	+	+	+	+	+	+	+	+	0	+	+	$0^{\surd}$
7	+	0	+	+	+	+	0	0	+	+	0	+	+	+	+	0	0	+	$0^{\surd}$
8	0	+	0	+	+	+	+	+	w	+	+	+	+	+	0	0	0	0	3+
9	0	+	0	+	+	+	+	+	0	0	+	+	0	+	+	+	0	0	3+

Case Study #2

R_2R_2 adsorbed plasma

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	M	N	S	s	Le^a	Le^b	P_1	PEG IgG
1	0	0	+	+	+	0	+	+	w	0	+	+	0	+	0	0	+	+	0^v
2	0	0	0	+	+	+	0	+	+	0	+	+	0	0	+	+	0	+	0^v
3	0	0	+	+	+	0	+	+	+	+	0	+	+	+	+	+	0	0	0^v
4	0	0	0	+	+	+	+	0	+	0	+	0	+	0	+	0	+	+	0^v
5	0	0	0	+	+	0	+	+	0	+	0	0	+	0	+	+	0	+	0^v
6	+	0	+	+	0	0	+	+	+	+	+	+	+	+	+	0	+	+	0^v
7	+	0	+	+	+	+	0	0	+	+	0	+	+	+	+	0	0	+	0^v
8	0	+	0	+	+	+	+	+	w	+	+	+	+	+	0	0	0	0	3+
9	0	+	0	+	+	+	+	+	0	0	+	+	0	+	+	+	0	0	3+

Cells 8 and 9 are reactive

- They are D negative and C positive
- This proves anti-C

Case Study #2

r’r adsorbed plasma

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	M	N	S	s	Le^a	Le^b	P_1	Peg IgG
1	0	0	+	+	+	0	+	+	w	0	+	+	0	+	0	0	+	+	$0^{\surd}$
2	0	0	0	+	+	+	0	+	+	0	+	+	0	0	+	+	0	+	$0^{\surd}$
3	0	0	+	+	+	0	+	+	+	+	0	+	+	+	+	+	0	0	$0^{\surd}$
4	0	0	0	+	+	+	+	0	+	0	+	0	+	0	+	0	+	+	$0^{\surd}$
5	0	0	0	+	+	0	+	+	0	+	0	0	+	0	+	+	0	+	$0^{\surd}$
6	+	0	+	+	0	0	+	+	+	+	+	+	+	+	+	0	+	+	$0^{\surd}$
7	+	0	+	+	+	+	0	0	+	+	0	+	+	+	+	0	0	+	$0^{\surd}$
8	0	+	0	+	+	+	+	+	w	+	+	+	+	+	0	0	0	0	$0^{\surd}$
9	0	+	0	+	+	+	+	+	0	0	+	+	0	+	+	+	0	0	$0^{\surd}$

Case Study #2

r’r adsorbed plasma

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	M	N	S	s	Le^a	Le^b	P_1	PEG IgG
1	0	0	+	+	+	0	+	+	w	0	+	+	0	+	0	0	+	+	0^v
2	0	0	0	+	+	+	0	+	+	0	+	+	0	0	+	+	0	+	0^v
3	0	0	+	+	+	0	+	+	+	+	0	+	+	+	+	+	0	0	0^v
4	0	0	0	+	+	+	+	0	+	0	+	0	+	0	+	0	+	+	0^v
5	0	0	0	+	+	0	+	+	0	+	0	0	+	0	+	+	0	+	0^v
6	+	0	+	+	0	0	+	+	+	+	+	+	+	+	+	0	+	+	0^v
7	+	0	+	+	+	+	0	0	+	+	0	+	+	+	+	0	0	+	0^v
8	0	+	0	+	+	+	+	+	w	+	+	+	+	+	0	0	0	0	0^v
9	0	+	0	+	+	+	+	+	0	0	+	+	0	+	+	+	0	0	0^v

There is no reactivity with the adsorbed plasma

- The r’r adsorption removes anti-C and anti-G
- This rules out anti-D

Case Study #2

Eluate from the R_2R_2 adsorption

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	M	N	S	s	Le^a	Le^b	P_1	PEG IgG
1	0	0	+	+	+	0	+	+	w	0	+	+	0	+	0	0	+	+	$0^{\surd}$
2	0	0	0	+	+	+	0	+	+	0	+	+	0	0	+	+	0	+	$0^{\surd}$
3	0	0	+	+	+	0	+	+	+	+	0	+	+	+	+	+	0	0	$0^{\surd}$
4	0	0	0	+	+	+	+	0	+	0	+	0	+	0	+	0	+	+	$0^{\surd}$
5	0	0	0	+	+	0	+	+	0	+	0	0	+	0	+	+	0	+	$0^{\surd}$
6	+	0	+	+	0	0	+	+	+	+	+	+	+	+	+	0	+	+	$0^{\surd}$
7	+	0	+	+	+	+	0	0	+	+	0	+	+	+	+	0	0	+	$0^{\surd}$
8	0	+	0	+	+	+	+	+	w	+	+	+	+	+	0	0	0	0	w+
9	0	+	0	+	+	+	+	+	0	0	+	+	0	+	+	+	0	0	w+

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Eluate from the R2R2 adsorption

	D	C	E	c	e	K	k	Fy^a	Fy^b	Jk^a	Jk^b	M	N	S	s	Le^a	Le^b	P_1	IgG
1	0	0	+	+	+	0	+	+	w	0	+	+	0	+	0	0	+	+	0^v
2	0	0	0	+	+	+	0	+	+	0	+	+	0	0	+	+	0	+	0^v
3	0	0	+	+	+	0	+	+	+	+	0	+	+	+	+	+	0	0	0^v
4	0	0	0	+	+	+	+	0	+	0	+	0	+	0	+	0	+	+	0^v
5	0	0	0	+	+	0	+	+	0	+	0	0	+	0	+	+	0	+	0^v
6	+	0	+	+	0	0	+	+	+	+	+	+	+	+	+	0	+	+	0^v
7	+	0	+	+	+	+	0	0	+	+	0	+	+	+	+	0	0	+	0^v
8	0	+	0	+	+	+	+	+	w	+	+	+	+	+	0	0	0	0	w+
9	0	+	0	+	+	+	+	+	0	0	+	+	0	+	+	+	0	0	w+

Cells 8 and 9 are reactive

- They are D negative and C positive
- Only anti-D and anti-G would adsorb onto the R2R2 cell
- Anti-D is ruled out in this elution
- This proves anti-G

Case Study #2

Summary

- Initial testing indicates anti-D, anti-C, and/or anti-G is present in the patient plasma
- The R_2R_2 adsorbed plasma proves the anti-C
- The r′r adsorbed plasma rules out the anti-D
- The eluate from the R_2R_2 adsorption proves the anti-G

Case Study #2

Conclusion

The patient has:

- Anti-C
- Anti-G

Additional alloantibodies were excluded

The previously identified anti-D was likely anti-G reacting with D positive red cells

Case Study #2

Administration of Rh Immune Globulin?

- Yes
- Why?
  - Patient has not developed anti-D

Key Takeaways

- If RhIg has already been administered, it is NOT necessary to perform G determination
- The purpose of anti-G determination is to assess if RhIg should be given
- Titers will NOT isolate anti-G
- Anti-G can only be isolated in an eluate

THANK YOU!

Questions?